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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/845,654	04/30/2001	Todd P. Lukanc	39153/371 (F0812)	2723

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EXAMINER
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MALDONADO, JULIO J

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/845,654

Applicant(s)

LUKANC ET AL.

Examiner

Julio J. Maldonado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/08/2003 has been entered.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 4, 5, 7, 8, 10, 11, 13-17, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al. (U.S. 6,156,485) in view of Maa (U.S. 4,460,435).

In reference to claims 1, 2, 4, 7, 8, 11-15, 17 and 19, Tang et al. (Figs.4A-4D) in a related method of high aspect ratio etching teach the steps of depositing a reflective metal layer (230) over a gate material layer (220), wherein said reflective metal layer (230) comprises tungsten; depositing a mask layer (150, 230) over the reflective metal layer (230), wherein said mask layer (150, 230) comprises a layer of anti-reflective coating (ARC) (230) and a layer of resist (150); removing portions of the anti-reflective

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coating (230) to form a pattern; etching the reflective metal layer (230) using the pattern formed from the removed portions of the anti-reflective coating (230); removing the anti-reflective coating (230); and removing portions of the gate material layer (220) using the pattern from the removed portions of the anti-reflective coating (230) transferred to the metal layer (230), wherein said ARC layer (230) comprises silicon oxynitride (SiON) and wherein the reflective metal layer is used as a hardmask (column 7, line 16 – column 8, line 3).

Tang et al. fail to teach depositing a polysilicon layer; and trim etching the tungsten layer. However, Maa (Figs.1-4) in a related patterning process teaches depositing a polysilicon layer (16) over an oxide layer (14) overlying a substrate (10); depositing a metal layer (18) over the polysilicon layer (16), wherein said metal comprises tungsten; depositing a photoresist layer (20) over the metal layer (18); patterning the photoresist layer (20); and trim etching the metal layer (18), wherein the etching step comprises isotropic etching (column 3, lines 11 – 59).

Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Tang et al. and Maa to enable the etching step of Tang et al. according to the teachings of Maa and furthermore to enable the formation of narrow lines in an integrated circuit (Maa, column 1, lines 19 – 32). Regarding polysilicon, the examiner takes official notice that polysilicon as a gate material was known at the time the invention was made. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine

the teachings of Maa and Tang et al. with the known process to enable the gate structure of Maa and Tang et al. to be formed.

In reference to claims 5, 10, 12, 16 and 20, the combined teachings of Tang et al. and Maa teach that the reflective material layer is optically opaque to the gate material layer with a thickness of about 500 to 3,000 angstroms (Tang et al., column 7, lines 16-34). The combination of Tang et al. and Maa fail to teach depositing said reflective material layer with a thickness of about 80-200 angstroms.

Notwithstanding, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

4. Claims 3, 6, 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al. ('485) in view of Maa ('435) as applied to claims 1, 2, 4, 5, 7, 8, 10, 11, 13-17, 19 and 20 above, and further in view of McKee (U.S. 5,804,088).

The combined teachings of Tang et al. and Maa substantially teach all aspects of the invention but fail to teach the steps of providing a gate structure comprising polysilicon and trim etching the anti-reflective coating to form a pattern, wherein said trim etching comprises isotropic etching. However, McKee (Figs.8a-83) in a related method to form gate structures teaches the steps of providing a gate material layer (806) comprising polysilicon; depositing an anti-reflective coating (821); and trim etching the anti-reflective coating (821) to form a pattern, wherein said trim etching comprises isotropic etching (column 5, line 23 – column 6, line 15). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to form a polysilicon gate material layer as taught by McKee in the high aspect ratio etching process of Tang et al. and Maa, since polysilicon gate structures are well-known its manufacture involves common knowledge in the art. Also it would also have been obvious to one of ordinary skill in the art at the time of the invention was made to trim etch the anti-reflective coating as taught by McKee in the high aspect ratio etching process of Tang et al., since this would reduce the line width of the gate structure (column 1, lines 59-63).

### ***Response to Arguments***

5. Applicant's arguments filed 07/08/2003 have been fully considered but they are not persuasive.
6. Applicants argue, "...the cited references do not disclose, suggest, or teach trim etching a reflective layer to form a pattern used as a mask to remove portions of a layer below the reflective layer...". In response to this argument, Tang et al. teach etching

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the gate material layer '220' using a reflective layer '230' as a mask (column 7, lines 54 – 65), wherein the reflective layer comprises tungsten. On the other hand, Maa teaches a trim etching step of a stack of layers including tungsten-comprising layer (18).

Therefore, by performing the trim-etching step described by Maa in the patterning process of Tang et al., a trim etched reflective layer would be obtained in Tang et al., and this trim etched layer would be used as a mask to etch the gate material layer below it for the intended purpose of obtaining narrower lines. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

### ***Conclusion***

7. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the


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hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via [julio.maldonado@uspto.gov](mailto:julio.maldonado@uspto.gov). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.



JMR  
9/5/03



George Fourson  
Primary Examiner